

Applicants: Patrick Gane, Matthias Buri and Beat Karth

Appl. No.: 10/532,261

Filed: April 21, 2005

Page 2

Amendments to the Claims

A listing of the claims, including Claims 1-33 as currently canceled and new Claims 34-83 as currently added, is set forth below.

1-33. (Canceled).

34. (New) An aqueous suspension of refined mineral matter comprising refined mineral matter and a grinding aid agent, wherein the grinding agent comprises a copolymer of:

a) at least one ethylenically unsaturated anionic monomer having (i) a monocarboxyl function selected from ethylenically unsaturated monomers having a monocarboxyl function, or (ii) a dicarboxyl function selected from ethylenically unsaturated monomers having a dicarboxyl function or (iii) a sulfonic function selected from ethylenically unsaturated monomers having a sulfonic function, or (iv) a phosphoric function selected from ethylenically unsaturated monomers having a phosphoric function, or (v) a phosphonic function selected from ethylenically unsaturated monomers having a phosphonic function or mixtures thereof,

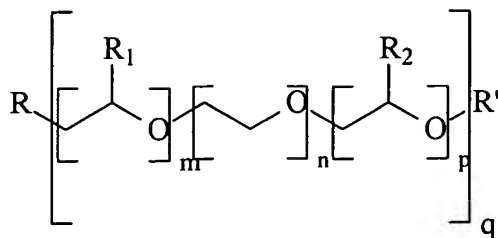
b) at least one non-ionic ethylenically unsaturated monomer of formula (I):

Applicants: Patrick Gane, Matthias Buri and Beat Karth

Appl. No.: 10/532,261

Filed: April 21, 2005

Page 3



where

- m and p represent a number of alkylene oxide units less than or equal to 150
- n represents a number of ethylene oxide units less than or equal to 150
- q represents an integer equal to at least 1 and such that $5 \leq (m+n+p)q \leq 150$,
- R₁ represents hydrogen or the methyl or ethyl radical
- R₂ represents hydrogen or the methyl or ethyl radical
- R represents a radical containing a polymerizable unsaturated function, belonging to the vinyl group and to the group of acrylic, methacrylic, maleic, itaconic, crotonic, and vinylphthalic esters and to the group of urethane unsaturates such as acrylurethane, methacrylurethane, α - α' dimethyl-isopropenyl-benzylurethane and allylurethane, and to the group of allyl or vinyl ethers, whether or not substituted, or to the group of ethylenically unsaturated amides or imides,
- R' represents hydrogen or a hydrocarbon radical having from 1 to 40 carbon atoms,

or a mixture of several monomers of formula (I),

Applicants: Patrick Gane, Matthias Buri and Beat Karth

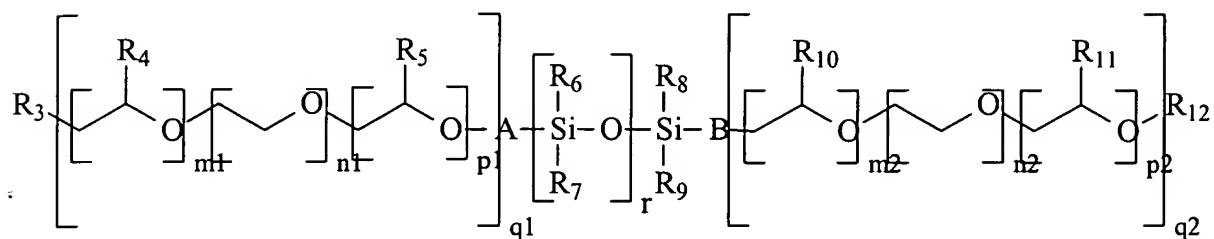
Appl. No.: 10/532,261

Filed: April 21, 2005

Page 4

c) at least one organofluorinated or organosilylated monomer selected from among the molecules of formulae (IIa) or (IIb) or (IIc) or mixtures thereof:

with formula (IIa)



where

- m₁, p₁, m₂ and p₂ represent a number of alkylene oxide units less than or equal to 150
- n₁ and n₂ represent a number of ethylene oxide units less than or equal to 150
- q₁ and q₂ represent an integer equal to at least 1 and such that 0 ≤ (m₁+n₁+p₁)q₁ ≤ 150 and 0 ≤ (m₂+n₂+p₂)q₂ ≤ 150,
- r represents a number such that 1 ≤ r ≤ 200
- R₃ represents a radical containing a polymerizable unsaturated function, belonging to the vinyl group and to the group of acrylic, methacrylic, maleic, itaconic, crotonic, and vinylphtalic esters and to the group of urethane unsaturates such as acrylurethane, methacrylurethane, α-α' dimethyl-isopropenyl-benzylurethane and allylurethane, and to the group of allyl or vinyl ethers, whether or not substituted, or to the group of ethylenically unsaturated amides or imides,
- R₄, R₅, R₁₀ and R₁₁ represent hydrogen or the methyl or ethyl radical

Applicants: Patrick Gane, Matthias Buri and Beat Karth

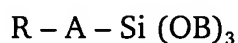
Appl. No.: 10/532,261

Filed: April 21, 2005

Page 5

- R_6, R_7, R_8 and R_9 represent straight or branched alkyl, aryl, alkylaryl or arylalkyl groups having from 1 to 20 carbon atoms, or a mixture thereof
- R_{12} represents a hydrocarbon radical having from 1 to 40 carbon atoms
- A and B are groups which may be present, in which case they represent a hydrocarbon radical having from 1 to 4 carbon atoms,

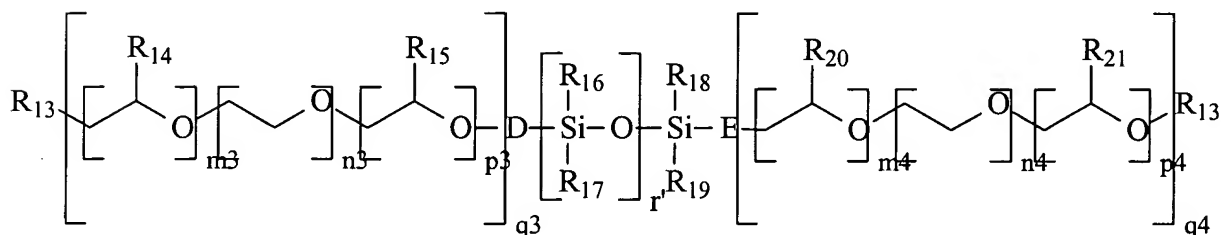
with formula (IIb)



where

- R represents a radical containing a polymerizable unsaturated function, belonging to the vinyl group and to the group of acrylic, methacrylic, maleic, itaconic, crotonic, and vinylphthalic esters and to the group of urethane unsaturates such as acrylurethane, methacrylurethane, α - α' dimethyl-isopropenyl-benzylurethane and allylurethane, and to the group of allyl or vinyl ethers, whether or not substituted, or to the group of ethylenically unsaturated amides or imides,
- A is a group which may be present, in which case it represents a hydrocarbon radical having from 1 to 4 carbon atoms,
- B represents a hydrocarbon radical having from 1 to 4 carbon atoms,

with formula (IIc)



Applicants: Patrick Gane, Matthias Buri and Beat Karth

Appl. No.: 10/532,261

Filed: April 21, 2005

Page 6

where

- m_3 , p_3 , m_4 and p_4 represent a number of alkylene oxide units less than or equal to 150
- n_3 and n_4 represent a number of ethylene oxide units less than or equal to 150
- q_3 and q_4 represent an integer equal to at least 1 and such that $0 \leq (m_3+n_3+p_3)q_3 \leq 150$ and $0 \leq (m_4+n_4+p_4)q_4 \leq 150$,
- r' represents a number such that $1 \leq r' \leq 200$,
- R_{13} represents a radical containing a polymerizable unsaturated function, belonging to the vinyl group and to the group of acrylic, methacrylic, maleic, itaconic, crotonic, and vinylphthalic esters and to the group of urethane unsaturates such as acrylurethane, methacrylurethane, α - α' dimethyl-isopropenyl-benzylurethane and allylurethane, and to the group of allyl or vinyl ethers, whether or not substituted, or to the group of ethylenically unsaturated amides or imides,
- R_{14} , R_{15} , R_{20} and R_{21} represent hydrogen or the methyl or ethyl radical
- R_{16} , R_{17} , R_{18} and R_{19} represent straight or branched alkyl, aryl, alkylaryl or arylalkyl groups having from 1 to 20 carbon atoms, or a mixture thereof
- D and E are groups which may be present, in which case they represent a hydrocarbon radical having from 1 to 4 carbon atoms,

d) optionally at least one monomer of the acrylamide or methacrylamide type or their derivatives or mixtures thereof, or at least one non water-soluble monomer, or at least one cationic monomer or quaternary ammonium,

Applicants: Patrick Gane, Matthias Buri and Beat Karth

Appl. No.: 10/532,261

Filed: April 21, 2005

Page 7

e) optionally at least one crosslinking monomer selected from the group consisting of ethylene glycol dimethacrylate, trimethylolpropanetriacrylate, allyl acrylate, the allyl maleates, methylene-bis-acrylamide, methylene-bis-methacrylamide, tetrallyloxyethane, triallylcyanurates, and allyl ethers prepared from polyols,

the total of the components a), b), c), d) and e) being equal to 100%,

and having an intrinsic viscosity less than or equal to 100 ml/g determined in accordance with the method known as the intrinsic viscosity method.

35. (New) The aqueous suspension of mineral substances refined according to claim 34 characterized in that said copolymer comprises, by weight, of:

- a) from 2% to 95% of at least one ethylenically unsaturated anionic monomer,
- b) from 97.9% to 4.9% of at least one non-ionic ethylenically unsaturated monomer of formula (I),
- c) from 0.1% to 50% of at least one organofluorinated or organosilylated monomer selected from among the molecules of formulae (IIa) or (IIb) or (IIc) or mixtures thereof,
- d) from 0% to 50% of at least one monomer of the acrylamide or methacrylamide type, or at least one non water-soluble monomer, or unsaturated esters, or vinyls, or at least one cationic monomer or quaternary ammonium,

Applicants: Patrick Gane, Matthias Buri and Beat Karth

Appl. No.: 10/532,261

Filed: April 21, 2005

Page 8

e) from 0% to 5% of at least one crosslinking monomer selected from the group consisting of ethylene glycol dimethacrylate, trimethylolpropanetriacrylate, allyl acrylate, the allyl maleates, methylene-bis-acrylamide, methylene-bis-methacrylamide, tetrallyloxyethane, triallylcyanurates, allyl ethers prepared from polyols,

the total of the components a), b), c), d) and e) being equal to 100%,
and in that said copolymer has an intrinsic viscosity less than or equal to 100 ml/g determined in accordance with the method known as the intrinsic viscosity method.

36. (New) The aqueous suspension of mineral matter according to claim 34, characterized in that said copolymer is in its acid form, fully neutralized or partially neutralized by one or more neutralizing agents having a monovalent neutralizing function or a polyvalent neutralizing function.

37. (New) The aqueous suspension of mineral matter according to claim 34, characterized in that it contains from 0.05% to 10% of said copolymer by dry weight with respect to the dry weight of mineral matter.

38. (New) The aqueous suspension of mineral matter according to claim 34, characterized in that it contains from 0.05% to 10% of said copolymer by dry weight with respect to the dry weight of mineral matter and at least one other dispersant or grinding aid agent.

39. (New) The aqueous suspension of mineral matter according to claim 38, characterized in that the other dispersant or grinding aid agent is selected from

Applicants: Patrick Gane, Matthias Buri and Beat Karth

Appl. No.: 10/532,261

Filed: April 21, 2005

Page 9

homopolymers or copolymers of acrylic acid in their acid form, or fully or partially neutralized by one or more neutralizing agents having a monovalent neutralizing function or a polyvalent neutralizing function, or of cations of higher valency, or H_3O^+ ion donors.

40. (New) The aqueous suspension of mineral matter according to claim 38, characterized in that it contains from 0.05% to 1.0% by dry weight with respect to the dry weight of mineral matter of said other dispersant or grinding aid agent.

41. (New) The aqueous suspension of mineral matter according to claim 34, characterized in that the mineral matter is selected from calcium carbonate, dolomite, gypsum, calcium hydroxide, satin white, titanium dioxide, aluminium trihydroxide, mica, talc, kaolins, calcine kaolins, or mixed carbonate based fillers of metals, and mixtures of said fillers, or mixtures with synthetic or natural fibres or co-structures of minerals.

42. (New) The aqueous suspension of mineral matter according to claim 34, characterized in that the suspension has a dry matter concentration of between 15% and 85% by weight.

43. (New) The aqueous suspension of mineral matter according to claim 34, characterized in that the mineral matter presents a median grain diameter, as measured using the Sedigraph™ 5100, of between 50 μm and 0.01 μm .

44. (New) The aqueous suspension of mineral matter according to claim 34, characterized in that the mineral matter grains have, for equivalent grain size, a BET specific surface area determined according to standard ISO 9277 less than that of the

Applicants: Patrick Gane, Matthias Buri and Beat Karth
Appl. No.: 10/532,261
Filed: April 21, 2005
Page 10

mineral matter grains of the aqueous suspensions of mineral matter refined using polyacrylates, homopolymers or copolymers.

45. (New) The aqueous suspension of mineral matter according to claim 34, characterized in that the pH of the final suspension is between 7.5 and 13.

46. (New) Paper, paint or plastic comprising a pigment prepared from the aqueous suspension of mineral matter according to claim 34.

47. (New) Paper comprising a pigment prepared from the aqueous suspension of mineral matter according to claim 34, wherein the pigment is included in the coating or surface treatment of the paper.

48. (New) Paper, board, or analogous sheets comprising a pigment prepared from the aqueous suspension of mineral matter according to claim 34, wherein the pigment is included as a filler in the paper, board or analogous sheets.

49. (New) Paper or board sheets comprising a pigment prepared from the aqueous suspension of mineral matter according to claim 34.

50. (New) Plastics comprising a pigment prepared from the aqueous suspension of mineral matter according to claim 34.

51. (New) The aqueous suspension of mineral matter according to claim 34, wherein the ethylenically unsaturated anionic monomer of (a) comprises acrylic or

Applicants: Patrick Gane, Matthias Buri and Beat Karth

Appl. No.: 10/532,261

Filed: April 21, 2005

Page 11

methacrylic acid, hemiesters of diacids, C₁ to C₄ monoesters of maleic or itaconic acid, or mixtures thereof; crotonic, isocrotonic, cinnamic, itaconic, maleic acid, anhydrides of carboxyl acids, maleic anhydride; acrylamido-methyl-propane-sulfonic acid, sodium methallylsulfonate, vinylsulfonic acid and styrenesulfonic acid; vinylphosphoric acid, ethylene glycol methacrylate phosphate, propylene glycol methacrylate phosphate, ethylene glycol acrylate phosphate, propylene glycol acrylate phosphate and their ethoxylates, or vinylphosphonic acid.

52. (New) The aqueous suspension of mineral matter according to claim 34, wherein the ethylenically unsaturated anionic monomer of (a) comprises acrylic acid and methacrylic acid.

53. (New) The aqueous suspension of mineral matter according to claim 34, wherein q in formula (I) represents an integer such that $15 \leq (m+n+p)q \leq 120$.

54. (New) The aqueous suspension of mineral matter according to claim 34, wherein R' in formula (I) represents a hydrocarbon radical having from 1 to 12 carbon atoms.

55. (New) The aqueous suspension of mineral matter according to claim 34, wherein R' in formula (I) represents a hydrocarbon radical having from 1 to 4 carbon atoms.

56. (New) The aqueous suspension of mineral matter according to claim 34, wherein in formula (I), R₁ and R₂ are hydrogen, R is methacrylate, and R' is methyl.

57. (New) The aqueous suspension of mineral matter according to claim 34, wherein in formula (I), R_1 and R_2 are hydrogen, R is vinyl, and R' is methyl.

58. (New) The aqueous suspension of mineral matter according to claim 34, wherein component c) is formula (IIb).

59. (New) The aqueous suspension of mineral matter according to claim 58, wherein in formula (IIb), R is vinyl, A is absent and B is methyl.

60. (New) The aqueous suspension of mineral matter according to claim 58, wherein in formula (IIb), R is methacrylate, A is propyl and B is methyl.

61. (New) The aqueous suspension of mineral matter according to claim 34, wherein d) is optionally a monomer comprising N-[3-(dimethylamino) propyl] acrylamide or N-[3-(dimethylamino) propyl] methacrylamide, and mixtures thereof; alkyl acrylates or methacrylates or mixtures thereof; N-[2-(dimethylamino) ethyl] methacrylate, N-[2-(dimethylamino) ethyl] acrylate, or mixtures thereof; vinyl acetate, vinylpyrrolidone, styrene, alphanethylstyrene, or mixtures thereof; [2-(methacryloyloxy) ethyl] trimethyl ammonium chloride, sulphate, [2-(acryloyloxy) ethyl] trimethyl ammonium chloride, sulphate, [3-(acrylamido) propyl] trimethyl ammonium chloride, sulphate, dimethyl diallyl ammonium chloride, sulphate, [3-(methacrylamido) propyl] trimethyl ammonium chloride or sulphate, or mixtures thereof.

Applicants: Patrick Gane, Matthias Buri and Beat Karth

Appl. No.: 10/532,261

Filed: April 21, 2005

Page 13

62. (New) The aqueous suspension of mineral matter according to claim 34, wherein e) is optionally a crosslinking monomer comprising an allyl ether prepared from pentacrylthritol, sorbitol or sucrose.

63. (New) The aqueous suspension of mineral matter according to claim 34, wherein the copolymer comprises from 3% to 25% of component a).

64. (New) The aqueous suspension of mineral matter according to claim 34, wherein the copolymer comprises from 4% to 15% of component a).

65. (New) The aqueous suspension of mineral matter according to claim 34, wherein the copolymer comprises from 95% to 65% of component b).

66. (New) The aqueous suspension of mineral matter according to claim 34, wherein the copolymer comprises from 92% to 78% of component b).

67. (New) The aqueous suspension of mineral matter according to claim 34, wherein the copolymer comprises from 0.2% to 10% of component (c).

68. (New) The aqueous suspension of mineral matter according to claim 34, wherein the copolymer comprises from 0.3% to 5% of component c).

69. (New) The aqueous suspension of mineral matter according to claim 34, wherein the copolymer comprises from 0% to 10% of component d).

Applicants: Patrick Gane, Matthias Buri and Beat Karth

Appl. No.: 10/532,261

Filed: April 21, 2005

Page 14

70. (New) The aqueous suspension of mineral matter according to claim 34, wherein the copolymer comprises from 0% to 5% of component d).

71. (New) The aqueous suspension of mineral matter according to claim 34, wherein the copolymer comprises from 0 to 3% of component e).

72. (New) The aqueous suspension of mineral matter according to claim 1, characterized in that said copolymer is in its acid form, fully neutralized or partially neutralized by one or more neutralizing agents comprising sodium, potassium, lithium, ammonium alkaline cations; primary, secondary or tertiary aliphatic and/or cyclic amines, stearylamine, ethanolamines; mono-, di- or triethanolamine; mono and diethylamine; cyclohexylamine, methylcyclohexylamine, aminomethylpropanol, morpholine; magnesium, calcium, or zinc alkaline earth divalent cations; and aluminium trivalent cations.

73. (New) The aqueous suspension of mineral matter according to claim 38, characterized in that the other dispersant or grinding aid agent is selected from sodium, potassium, lithium or ammonium alkaline cations; primary, secondary or tertiary aliphatic and/or cyclic amines, stearylamine, ethanolamines (mono-, di-, triethanolamine); mono and diethylamine; cyclohexylamine, methylcyclohexylamine, aminomethylpropanol, morpholine; magnesium, calcium, or zinc alkaline earth divalent cations; aluminium trivalent cations; and H_3O^+ ion donors, phosphoric acid and/or its salts with mono and/or divalent bases.

Applicants: Patrick Gane, Matthias Buri and Beat Karth

Appl. No.: 10/532,261

Filed: April 21, 2005

Page 15

74. (New) The aqueous suspension of mineral matter according to claim 73, wherein the other dispersant or grinding aid agent is phosphoric acid and/or its salts with soda and/or lime.

75. (New) The aqueous suspension of mineral matter according to claim 34 characterized in that the mineral matter is calcium carbonate.

76. (New) The aqueous suspension of mineral matter according to claim 34, characterized in that the mineral matter is calcium carbonate selected from marble, calcite, chalk or mixtures thereof.

77. (New) The aqueous suspension of mineral matter according to claim 34, characterized in that the mineral matter is calcium associated with magnesium, talc-calcium carbonate or calcium carbonate-kaolin mixtures, mixtures of calcium carbonate with aluminium trihydroxide, talc-calcium carbonate or talc-titanium dioxide co-structures.

78. (New) The aqueous suspension of mineral matter according to claim 34, characterized in that the suspension has a dry matter concentration of between 40% and 80%.

79. (New) The aqueous suspension of mineral matter according to claim 34, characterized in that the suspension has a dry matter concentration of between 50% and 78%.

Applicants: Patrick Gane, Matthias Buri and Beat Karth

Appl. No.: 10/532,261

Filed: April 21, 2005

Page 16

80. (New) The aqueous suspension of mineral matter according to claim 34, characterized in that the mineral matter presents a median grain diameter, as measured using the Sedigraph™ 5100, of between 5 μm and 0.2 μm .

81. (New) The aqueous suspension of mineral matter according to claim 34, characterized in that the mineral matter presents a median grain diameter, as measured using the Sedigraph™ 5100, of between 2 μm and 0.3 μm .

82. (New) The aqueous suspension of mineral matter according to claim 34, characterized in that the pH of the final suspension is between 8 and 12.

83. (New) The aqueous suspension of mineral matter according to claim 34, characterized in that the pH of the final suspension is between 8.5 and 10.